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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/590,052	08/21/2006	Hitoshi Kuma	293327US2PCT	5575

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EXAMINER	
SNYDER, ZACHARY J	

ART UNIT	PAPER NUMBER
2889	

NOTIFICATION DATE	DELIVERY MODE
09/03/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/590,052	KUMA, HITOSHI	
	Examiner	Art Unit	
	Zachary Snyder	2889	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 5/11/2009, with respect to the rejection(s) of claim(s) 1-9 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of JP 2004-083563 to Shinya et al. in view of U.S. PG Publication 2003/0214233 A1 to Takahashi et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3 and 5-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2004-083563 to Shinya et al. in view of U.S. PG Publication 2003/0214233 A1 to Takahashi et al.

In regard to claim 1, Shinya discloses a fluorescent conversion medium comprising:

fluorescent particles comprising semiconductor nanocrystals (InN nanocrystal used as fluorescent substance, paragraph 21), the particles absorbing visible light (light source is blue, paragraph 04) to emit fluorescence of a different wavelength,

a transparent medium (transparent member applied with fluorescent substance, paragraph 43) holding the fluorescent particles dispersed therein.

Shinya does not expressly disclose that the transparent medium holding the fluorescent particles satisfies the following inequality $0.4 < C \cdot d/r3 < 5.0$

wherein r is the average diameter (unit: nm) of the fluorescent particles, d is the film thickness (unit: micrometer) of the fluorescent conversion medium, and C is the volume ratio (unit: vol%) of the fluorescent particles to the fluorescent conversion medium.

Shinya discloses that the average diameter of the fluorescent particles is 4 nm (paragraph 52), the film thickness is 3 micrometers (paragraph 52), but does not disclose the volume ratio at which the phosphor material should be dispersed in the transparent resin.

Takahashi teaches in figure 7 a light emitting element comprising a fluorescence emitting layer 67 that comprises a transparent binder 66 and phosphor material 65 that is mixed together with a concentration of 2 to 20% by volume (paragraph 66).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Takahashi and Shinya before him or her, to modify the fluorescent conversion layer of Shinya to comprise volume ratio as taught by Takahashi order to reduce the overall size of the light emission device without sacrificing luminescent efficiency (paragraph 9).

In regard to claim 2, Shinya in view of Takahashi teaches all the limitations of claim 1. Shinya also teaches that a bulk material used for the semiconductor nanocrystals has a band gap of 1.0 to 3.0 eV at 20°C (InN has 1.8 eV band gap at room temperature, paragraph 21).

In regard to claim 3, Shinya in view of Takahashi teaches all the limitations of claim 1. Shinya also teaches that the fluorescent particles are core/shell semiconductor nanocrystals

comprising a core particle made of a semiconductor nanocrystal and a shell layer made of a second semiconductor material having a larger band gap than the band gap of the semiconductor material used for the core particle (semiconductor particle crystal (nanocrystal fluorescent substance) is considered a multilayer structure wherein the inner core layer has a smaller band gap then the shell layer, paragraph 29).

In regard to claim 5, Shinya in view of Takahashi teaches the fluorescent conversion medium according to claim 1 and a fluorescent conversion substrate comprising a transparent support substrate and

the fluorescent conversion part of claim 1 provided on the transparent support substrate (fluorescent substance applied to a transparent board-shape object, paragraph 42).

In regard to claim 6, Shinya in view of Takahashi teaches the fluorescent conversion medium according to claim 1 and a color light emitting apparatus comprising a light source emitting visible light (light emitting diode emits blue light, paragraph 4) and the fluorescent conversion part from claim 1 receiving the light from the light source to emit fluorescence of a longer wavelength (luminescent device which provides the light of long wavelength from the primary light source, paragraph 1).

In regard to claim 7, Shinya in view of Takahashi teaches all the limitations of claim 6. Shinya also teaches that the fluorescent conversion part is a multilayer structure (shown in figure 3a and b) of the fluorescent conversion medium (fluorescent substance 31) and a color filter

(wavelength 32), the color filter transmitting light in a wavelength region of the fluorescence from the fluorescent conversion medium, and cutting off light in the other wavelength region (wavelength filter 32 absorbs or reflects light with a wavelength of less than 395 nm, paragraph 35).

In regard to claim 8, Shinya in view of Takahashi teaches a color light emitting apparatus comprising:

a light source emitting at least blue light (light emitting device of 500 nm or less, paragraph 26), and

a fluorescent conversion part comprising pixels of red (R), green (G) and blue (B), the part receiving light from the light source to emit red, green or blue light (nano crystal can realize a fluorescent substance of green, red, and blue, paragraph 24),

the pixels of red (R) and green (G) comprising the fluorescent conversion medium according to claim 1 (paragraph 24), and

the pixel of blue (B) comprising a color filter (wavelength filter 32, paragraph 35).

In regard to claim 9, Shinya in view of Takahashi teaches the fluorescent conversion medium of claim 1 and Shinya also teaches a color light emitting apparatus comprising a light source emitting at least blue light (light emitting device of 500 nm or less, paragraph 26), and

the fluorescent conversion medium according to claim 1 receiving light from the light source to emit light in at least one color ranging from green to red (red and green fluorescent substance is present, paragraph 4) and

transmit part of the blue light emitted from the light source (when using a GaN light source diode, the diode itself is used for blue, paragraph 4).

In regard to claims 10, 11, and 12, Shinya in view of Takahashi teaches the color light emitting apparatus according to claims 6, 8, and 10 but does not teach that the light source is an organic electroluminescent device, and the organic electroluminescent device is comprising, a first light-reflective electrode, a second transparent electrode, and an organic luminescent medium comprising an organic emitting layer between the first and second electrodes.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ an OLED light source using the fluorescent conversion medium disclosed by Shinya in view of Takahashi because an OLED light source has several advantages over other light sources such as a wide viewing angle due to the OLED pixels producing their own light, the organic layers of an OLED being thinner, lighter, and more flexible than the crystalline layers in a LED or LCD, as well as the decrease in power consumption by OLEDs in comparison to LCDs.

It also would have been obvious to one of ordinary skill in the art at the time the invention was made to include the fluorescent substance taught by Shinya in view of Takahashi in an organic electroluminescent device having a first light-reflective electrode, a second transparent electrode, and an organic luminescent medium comprising an organic emitting layer between the first and second electrodes. The light reflective electrode, transparent electrode, and organic luminescent medium comprising an organic emitting layer between the transparent and

reflecting electrodes is the structure of a conventional organic electroluminescent device. It is known in the art that conventional organic electroluminescent devices include fluorescent substances because red and green OLED films have longer lifetimes than blue OLED films. To have a full color display that will be able to have an equal lifetime for each color, monochromatic light sources are used in unison with a fluorescent conversion medium.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made that the fluorescent color conversion medium taught by Shinya in view of Takahashi would be a suitable energy efficient conversion layer for use in the organic electroluminescent device (paragraphs 71 and 72).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over J.P. 2004-083653 to Shinya et al. in view of U.S. PG Publication 2003/0214233 A1 to Takahashi et al. as applied to claims 1-3 and 5-9 above, and further in view of J.P. 2002-107497 to Yasuo.

In regard to claim 4, Shinya in view of Takahashi teaches all the limitations of claim 3. Shinya also teaches that the transparent medium is a resin (distribute semiconductor particle crystal in resin, paragraph 35), but does not specifically state that the surface of the shell layer is subjected to a compatibility-treatment to enhance the affinity to the resin.

Yasuo discloses an image conversion panel using a fluorescent substance (paragraph 1) for the conversion of light. The fluorescent conversion substance's outer surface is treated with a carboxylic acid group that improves the affinity (compatibility) between the outer surface of the fluorescent substance particle and the resin (paragraph 30).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to subject the surface of the shell layer of the fluorescent conversion medium taught by Shinya in view of Takahashi to a compatibility-treatment to enhance the affinity to the resin as taught by Yasuo because Yasuo teaches that this will improve the dispersion stability of the fluorescent substance particle.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over J.P. 2004-083653 to Shinya et al. in view of U.S. PG Publication 2003/0214233 A1 to Takahashi et al. as applied to claims 1-3 and 5-9 above, and further in view of U.S. Patent 5,115,329 to Ikarashi et al.

In regard to claims 13 and 14, Shinya in view of Takahashi teaches the limitations of claim 1 but does not teach the claimed nanocrystal and medium materials.

Ikarashi teaches in figure 5 an electroluminescence device with a light emitting layer 3 that has fluorescent powders 5 and resin 6 wherein the powder 5 comprises a mixed crystal of ZnS or ZnS and ZnSe (COL. 1, LINE 34) and resin 6 comprises polyvinyl alcohol (COL. 1, LINE 36).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Shinya, Takahashi, and Ikarashi before him or her, to modify the nanocrystals and transparent medium of Shinya in view of Takahashi's fluorescent conversion medium to comprise the materials as taught by Ikarashi since these materials are well known in

the art for the creation of a fluorescent conversion medium while being cost effective and readily available.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zachary Snyder whose telephone number is (571)270-5291. The examiner can normally be reached on Monday through Thursday, 7:30AM to 6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Toan Ton can be reached on (571)272-2303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Toan Ton/
Supervisory Patent Examiner, Art Unit 2889

/Zachary Snyder/
Examiner, Art Unit 2889